

cantans), the most remarkable songster by far of the Amazonian forest. When its singular notes strike the ear for the first time the impression cannot be resisted that they are produced by a human voice. Some musical boy must be gathering fruits in the thickets, and is singing a few notes to cheer himself. The tones become more fluty and plaintive; they are now those of a flageolet, and, notwithstanding the utter impossibility of the thing, one is for the moment convinced that some one is playing that instrument. . . . It is the only songster which makes an impression on the natives, who sometimes rest their paddles whilst travelling in their small canoes, along the shady by-paths, as if struck by the mysterious sound."

Outside of these pre-eminently tuneful groups—thrushes, warblers, finches, &c.—there are many species belonging to groups considered songless which nevertheless do sing, or have, at any rate, some highly musical notes. Dendrocolapine birds are not, strictly speaking, songsters; but they are loquacious, and fill the woods with sound, often pleasant and laughter-like in character; and in many species the male and female combine their voices in a pretty kind of chorus. In the well-known oven-bird this is very striking, the male and female singing a ringing joyous duet in different tones, producing an harmonious effect. D'Orbigny notices this harmonious singing of the *Furnarius*. The hirundines in many cases have voices utterly unlike those of Europe, which as a rule only emit a squeaking twitter. They have, on the contrary, rather thick tones, in many cases resembling the throat-notes of the skylark, and some have a very pleasing set song. The human-like tones of some of the pigeons, the plaintive fluting of the Tinamous, even the notes of some kingfishers and cuckoos, contribute not a little to the bird-music of South America. Waterton's words about the "songless" bell-bird are well known, and, allowing that he goes too far when he says that Orpheus himself would drop his lyre to listen to this romantic sound, it is still certain that there are hundreds of species, which, like the bell-bird of the Orinoco forests, utter a few delightful notes, or produce a pleasing effect by joining their voices in a chorus. Thus, Mr. Bates speaks of the *Monasa nigrofrons*—a barbet:—"This flock of Tamburi-para were the reverse of dull: they were gamboling and chasing each other amongst the branches. As they sported about they emitted a few short tuneful notes, which altogether produced a ringing musical chorus that greatly surprised me."

But even leaving out all these irregular melodists; also omitting the tanagers, the tyrants, and their nearest allies; the Dendrocolaptidæ and Formicariidæ, and the humming-birds—these few families I have mentioned comprising about 1800 species—there would still be a far greater number of regular songsters than Europe can show, so great is the bird-wealth of South America; and concerning the merits of their music I can only say that Azara and D'Orbigny did not hear the best singer—the *Mimus triurus*. It would have been strange indeed if in that portion of the globe, so inconceivably rich in species, and where bird-life has had its greatest development, the faculty of melody had not been as highly perfected as in other regions.

A very long time has passed since Azara made that remark about a choir of song-birds selected in Paraguay, and our knowledge on this subject—possibly because it has been thought unimportant—has scarcely been added to since his day; but it seems to me that when the best singers of two regions have been compared, and a verdict arrived at, something more remains to be said. The species which "formally take their stand for the purpose of singing" sometimes delight us less than others which have no set song, but yet utter notes of exquisite purity. Nor is this all. To most minds the dulcet strains of a few favoured songsters contribute only a part, and not always the largest part, of the pleasurable

sensations received from the bird-voices of any district. All natural sounds produce, in some measure, agreeable sensations: the pattering of rain on the leaves, the lowing of cattle, the dash of waves on the beach, the "springs and dying gales" of a breeze in the pines; and so, coming to birds, the clear piercing tones of the sand-piper, the cry, etherealised by distance, of a passing migrant, the cawing of rooks on the tree-tops, afford as much pleasure as the whistle of the blackbird. There is a charm in the infinite variety of bird-language heard in a sub-tropical forest, where birds are most abundant, exceeding that of many monotonously melodious voices; the listener would not willingly lose any of the many indescribable sounds emitted by the smaller species, or the screams and human-like calls, or solemn, deep booming or drumming of the larger kinds, or even the piercing shrieks which may be heard miles away. The bird-language of an English wood or orchard, made up in most part of melodious tones, may be compared to a band composed entirely of small wind-instruments with a very limited range of sound, and which produces no storms of noise, eccentric flights, or violent contrasts, or anything to startle the listener—a sweet but somewhat tame performance. The sub-tropical forest is more like an orchestra in which a countless number of varied instruments take part in a performance in which there are many noisy discords, while the tender, spiritual tones heard at intervals seem, by contrast, infinitely sweet and precious.

W. H. HUDSON

FORESTRY

THE report of the proceedings of the Select Committee on Forestry which sat during the past summer does not, perhaps, throw any more light on the condition of forestry in this country than was possessed before the appointment of the Committee, for the substance of the evidence given is for the most part to be found in the various works and reports on forestry that have appeared from time to time during the past few years; nevertheless the evidence of such men so well versed in forest conservancy, especially with regard to India, as Dr. Cleghorn, Col. Michael, Col. Pearson, and Mr. W. G. Pedder is of much value, as it brings together in a collected form information that has hitherto been much scattered.

The subject of forest produce is one that is but little understood or even thought of by people in general. It is supposed by most people to relate only to the supply of timber, which indeed of itself is of very great importance; but when we consider the other products—such as gums, resins, oils, fibres, and such like—the enormous money value becomes more apparent, as well as the great importance of the forests as sources of many absolute necessities of life. The evidence of Col. Michael fully illustrates this and is especially valuable from this point of view. Taking the subject of Indian timbers alone, the value of teak was fully set forth when it was shown to be unequalled for the backing of ironclads and for ship-building generally, as offering the greatest resistance of any known woods. Questioned as to whether teak was capable of being brought into this country as a commercial article at a remunerative profit, Col. Michael replied that, judging from the price realised for some logs sold at the Forestry Exhibition at Edinburgh and from other information obtained, no doubt existed that the trade in teak might become a very remunerative one. It was shown further that in 1883 647,000*l.* worth of teak was imported into England; but Col. Michael also touched upon what, if put upon a proper footing, might equally, or perhaps more so, become a source of revenue to India and a boon to this country—namely, the introduction of the more ornamental woods for cabinet purposes. There is, of course, always a steady demand for British-grown

timbers such as oak, elm, ash, maple, &c., but these have to be supplemented by foreign woods of a more ornamental character, and of these mahogany, rosewood, ebony, satinwood, and such like are the best known. From amongst Indian timber trees a long list might be made of woods which are now almost unknown out of their native country—such, for instance, as the East Indian cedar (*Cedrela toona*), which is a reddish-coloured wood with a splendid wavy or feathery figure; the tree is also found in Australia, where the wood is highly valued; the padouk (*Pterocarpus indicus*), the deep-red-coloured wood of which attracted so much attention at the Edinburgh Exhibition last year; the Malabar Kino tree (*Pterocarpus marsupium*), also a finely-marked deep-red wood, several species of *Terminalia*, durable woods of a brown colour with darker brown markings. Many others might be mentioned, but the most beautiful of all the Indian woods for its ornamental character is the Chittagong wood (*Chickrassia tabularis*). This is of a brown colour, with transverse lighter silvery-brown wavy markings, which impart to it a varying depth of light and shade, which, when polished, imparts a peculiar and charming lustre. All these woods take a high polish, and would be invaluable for cabinet-work. Fine specimens of these and many others are in the collection of Indian timbers exhibited in the No. 3 Museum at Kew.

On the question as to the durability of the Scotch fir (*Pinus sylvestris*) Col. Pearson gave an opinion which is worth quoting. He says:—"I think myself that as the value of the foreign imported timber increases, as it must do as the quantity diminishes, people will come to appreciate more the Scotch fir, because I know many barns which have been boarded with Scotch fir for twenty years, and which are standing perfectly well: but it is convenient to get the imported boards ready sawn out, and where the people can get them cheap they do not pay attention to the Scotch and home-grown timber. But, speaking for myself, I should say that Scotch fir is a perfectly good wood as long as it is sufficiently mature, and I think, as foreign wood becomes dearer, as it will in a few years, English timber and Scotch timber will become of a value which it has not now."

On the general subject of the proposed Forest School Col. Pearson expressed himself in favour of a Chair of Forestry at the Edinburgh University, but he further stated that he had no actual faith in lectures in the school unless illustrated by practical instruction. "If," he says, "you tell a man in the lecture room that such and such consequences will take place, and do not show him the consequences on the spot, he does not believe anything about it; it goes in at one ear and out at the other; he will think it all nonsense; but if you want to impress your teaching upon him, you must take him out into the forests and show him the operations of Nature." Regarding the extent or scope of the School, Mr. Thiselton Dyer, in reply to Sir Edmund Lechmere whether he would not make the School of Forestry applicable to India and the Colonies as well as to our own country, said, "I should like to get all the fish possible into the net, and if we had such a school, to make it as useful as possible. I think it is surprising, considering how large is the interest of the English race in forestry, that except in India we have taken no kind of active interest in the subject: although we own more forests in the world than any other race, we are at present, except in the most piecemeal fashion, absolutely washing our hands of the whole business." Mr. Dyer, in his evidence, further pointed out by way of illustration a few of what are usually called the minor industries of forest produce, which in the aggregate become of considerable national importance.

It is to be regretted that the Committee was not nominated at an earlier period of the session. The first

sitting was on July 14, and at the two subsequent sittings on July 21 and 24, witnesses only were examined. The report of the Committee refers to the impossibility of concluding their investigations during the Session, and "recommends that a Committee on the same subject should be appointed in the next Session of Parliament."

JOHN R. JACKSON

OBSERVATIONS ON THE RECENT CALCAREOUS FORMATIONS OF THE SOLOMON GROUP, MADE DURING 1882-84¹

ON account of the treacherous character of the natives of the Solomon Group, no extensive geological observations have ever been made in these islands from the period of their discovery by the Spaniards three centuries ago. For this reason my excursions in these regions were not free from personal risk; in many places they were considerably curtailed, and in some islands they had to be abandoned altogether.

This archipelago includes seven or eight large islands, some of which are from seventy to eighty miles in length, and the highest from 8000 to 10,000 feet in height. Besides these, there are a great number of smaller islands and islets, some of volcanic and others of recent calcareous formations. Restricting my remarks to those islands which are wholly or in part composed of these calcareous rocks, I may observe that, although only able to become acquainted with a small portion of the Solomon Group, the islands which I examined represent the different types of islands that there exist.

In this, the largest of the Pacific groups, I not only found existing fringing-reefs, barrier-reefs, and atolls, but I discovered pre-existing reefs of these three chief classes which have been recently elevated to a height often of several hundred feet above the sea. My observations on these recently-elevated reefs and their foundations have enabled me to approach the problem of the formation of coral reefs by the inductive rather than by the *a priori* method: for it is evident that in passing from the consideration of a probable cause of the formation of existing reefs to the examination of ancient reefs that have been raised with their foundations above the sea, we enter a domain of greater certainty. I purpose in this abstract to state concisely the principal characters of the islands which are wholly or in part of calcareous formations; then to draw four limited inferences from these facts of observation without reference to any particular views that may be held on the subject of the origin of coral reefs; and finally to compare such conclusions with the prevailing views on that subject.

In the first place there are numerous small islands and islets less than a hundred feet in height, which are composed in mass of coral limestone. Of this class Stirling Island may be taken as an example. In the bold cliffs, which form the weather coast of this small island, there are numerous imbedded masses of the reef-building corals, many of them measuring four feet across, the majority of them in the position of growth, but some of them inverted.

The island of Ugi, which is six miles in length and about 500 feet in height, may be taken as a type of the next class. Its geological structure may be briefly described as composed in bulk of a soft earthy bedded deposit, possessing the characters of the "volcanic muds" of the *Challenger* soundings, containing numerous Foraminifera, and encrusted near the coast by coral limestone, which almost disappears in the higher regions. The greatest thickness of the coral limestone that I found in this island was between 90 and 100 feet. As one ascends the higher slopes of the island the coral limestone thins away, and

¹ By H. B. Guppy, M.B., F.G.S., late Surgeon of H.M.S. *Lark*. [Abstract of a paper read before the Royal Society of Edinburgh, on June 15th, 1885, being communicated by Mr. John Murray.]